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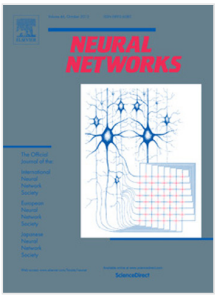

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Adaptive Low-rank Subspace Learning with Online Optimization for Robust Visual Tracking

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Abstract

In recent years, sparse and low-rank models have been widely used to formulate appearance subspace for visual tracking. However, most existing methods only consider the sparsity or low-rankness of the coefficients, which is not sufficient enough for appearance subspace learning on complex video sequences. Moreover, as both the low-rank and the column sparse measures are tightly related to all the samples in the sequences, it is challenging to incrementally solve optimization problems with both nuclear norm and column sparse norm on sequentially obtained video data. To address above limitations, this paper develops a novel low-rank subspace learning with adaptive penalization (LSAP) framework for subspace based robust visual tracking. Different from previous work, which often simply decompose observations as low-rank features and sparse errors, LSAP simultaneously learns the subspace basis, low-rank coefficients and column sparse errors to formulate appearance subspace. Within LSAP framework, we introduce a Hadamard production based regularization to incorporate rich generative/discriminative structure constraints to adaptively penalize the coefficients for subspace learning. It is shown that such adaptive penalization can significantly improve the robustness of LSAP on severely corrupted data set. To utilize LSAP for online visual tracking, we also develop an efficient incremental optimization scheme for nuclear

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